Bringing up FOSS GPU Drivers on Freescale i.MX6 Systems

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Lucas Stach <l.stach@pengutronix.de>

Who's the guy in front?

- Lucas Stach
- Kernel- and graphics developer at Pengutronix
- Providing customers with stable Linux based on mainline for their projects
- Engineering made-to-measure solutions
- Helping customers to reduce long time maintanace cost by bringing things mainline

Where are we coming from

- IP Vendor deliver drivers
  - “open” kernel driver
  - Large closed-source userspace component

Where are we coming from

- Non-technical problems
  - Vendor lock-in
  - Licencing issues
  - Code hidden and not auditable

Where are we coming from

- Technical issues
  - Updating systems non-trivial
  - API support missing
  - Bugfixes take a long time to arrive

Where do we want to go

- Have a dependable, fully open base driver
- Easily extendable with new API support
- Security fixes possible over the full period of industrial chip lifetime

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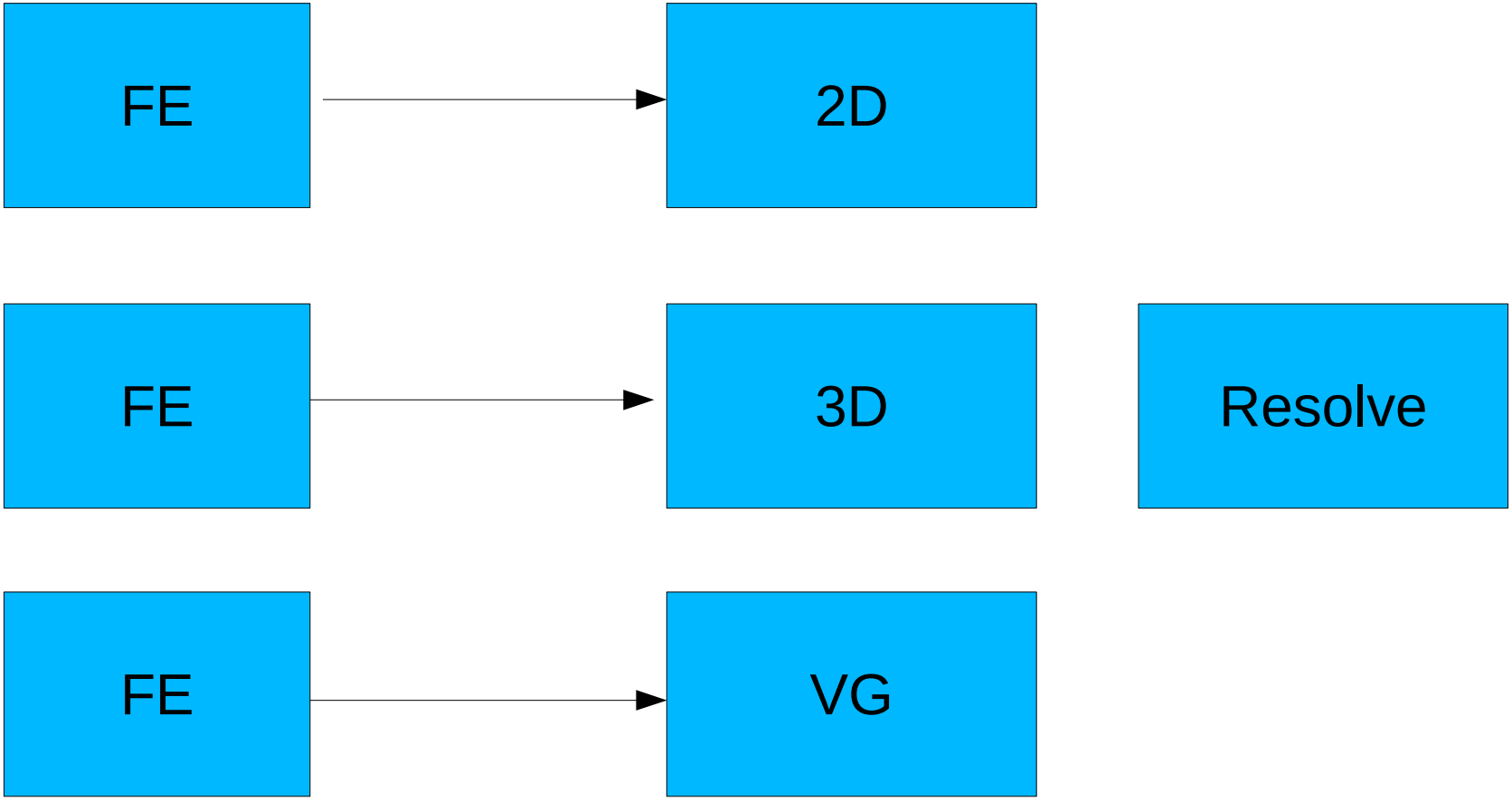
- Security fixes possible over the full period of industrial chip lifetime
- And some of us just want to run Quake 3

i.MX6 Vivante hardware

- Different IP cores for 2D, 3D and VG
- 2D core for low power operations and some video
- 3D core (straight-) forward renderer
- Modelled after DX9 pipeline + unified shaders
- Higher end models have thread walker for compute

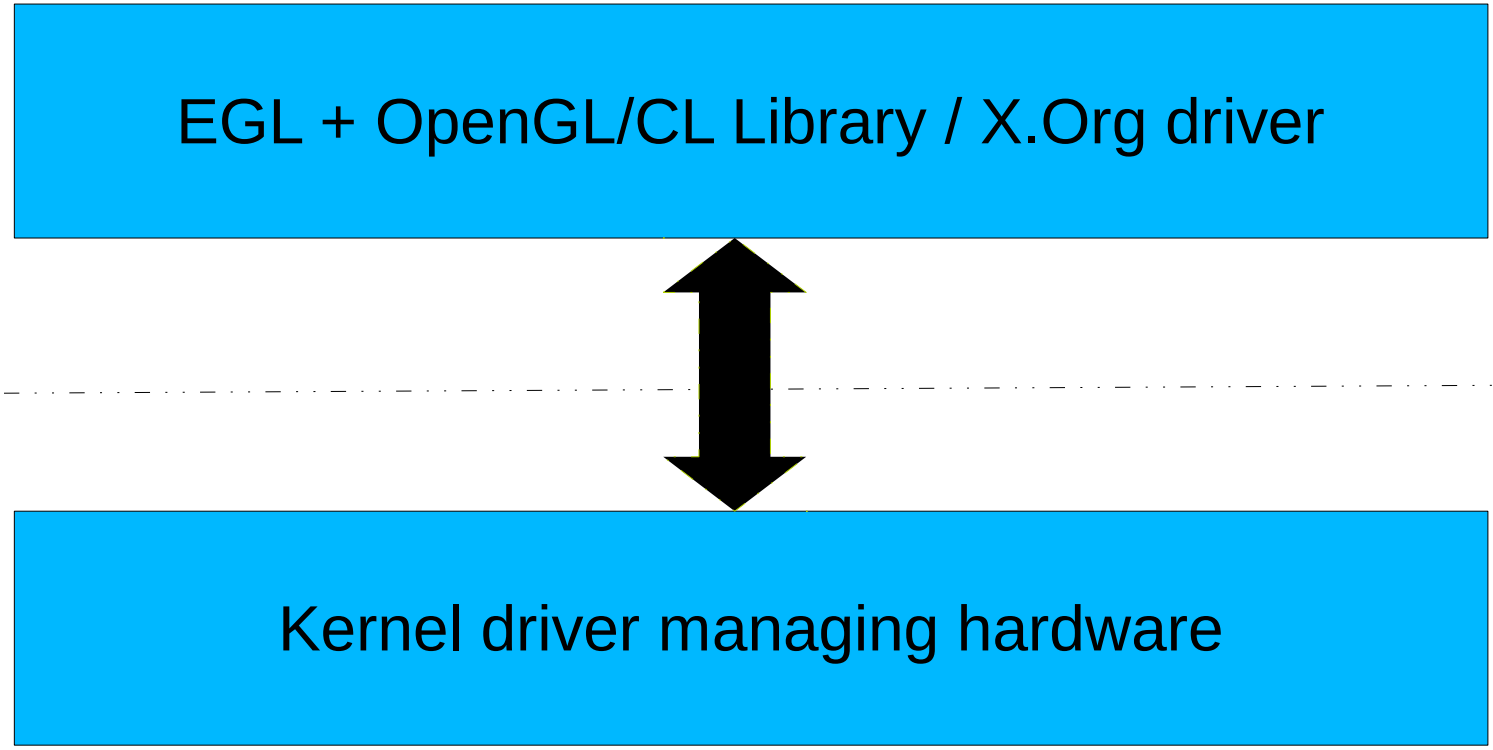
i.MX6 hardware configuration



Etnaviv project

- FOSS driver for the Vivante IP cores
- Started as a reverse engineering project by Wladimir J. van der Laan
- Contributions from others like Christian Gmeiner
- Lots of the commands and ISA are known

Linux graphics driver concept



Etnaviv kernel driver

- Christian Gmeiner started kernel work in 2014
- Defining user-kernel API mostly complete
- Lots of stabilization has landed
- Power management supported in a simple form

Etnaviv kernel driver

- Replaced fat and obfuscated Vivante kernel driver
- Readable code
- 60+ KLOC → 6.5 KLOC

Outlook after mainling

- Better power management by use of core internal DVFS
- More secure command stream validation
- Better client separation by own address spaces
- Better insight for application developers by exporting performance counters

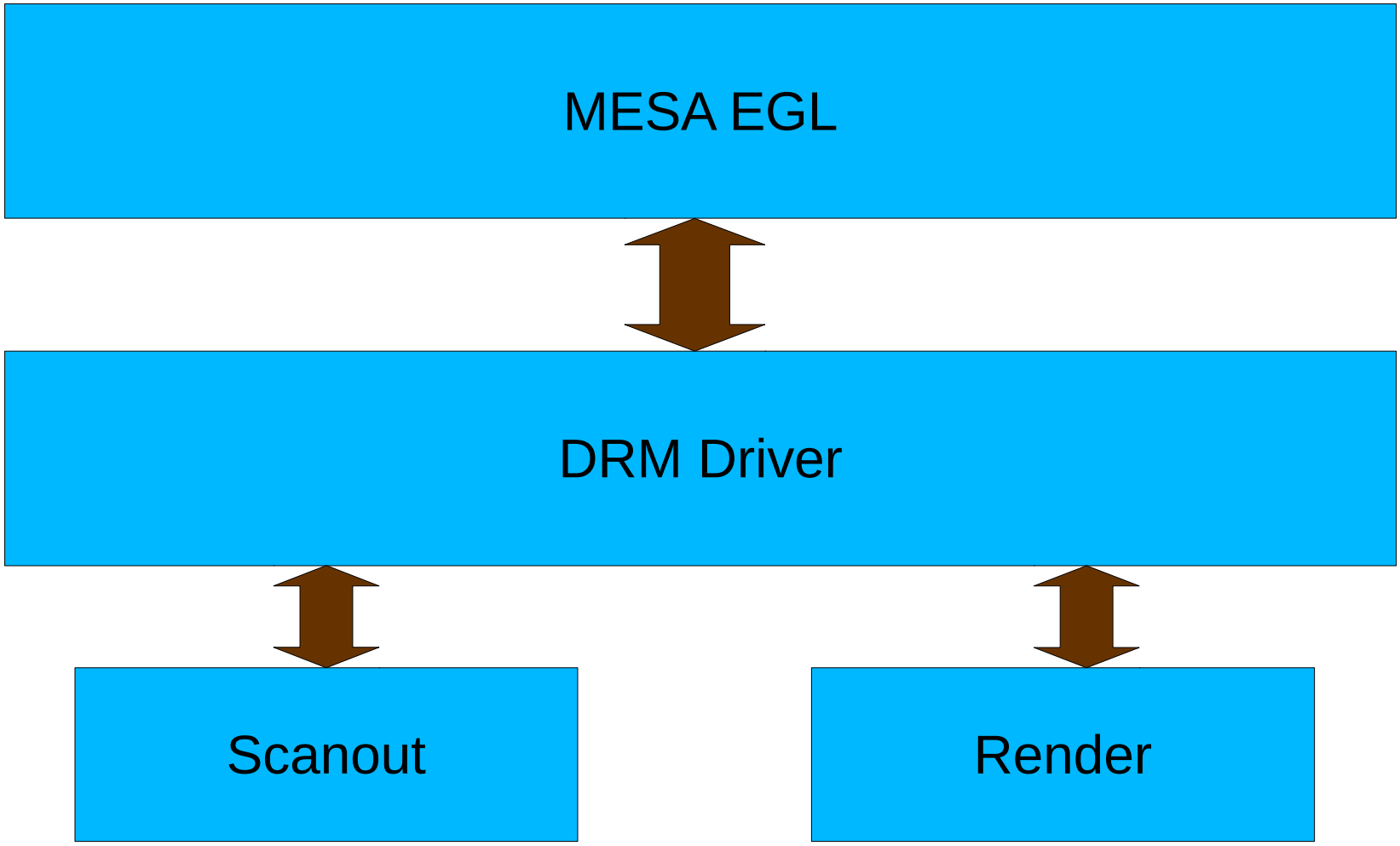
Etnaviv X.Org driver

- Xf86-video-armada is able to drive 2D GPU
- Mostly developed by Russell King
- Provides 2D acceleration for common operations
- X-Video acceleration

Etnaviv MESA driver

- Started by Wladimir on top of the Vivante kernel driver and libetna
- Reworked to work on top of etnaviv DRM driver
- Able to run simple applications
  - GUI acceleration in QT5
- Lots of bugfixing still outstanding

Embedded is (not so) special



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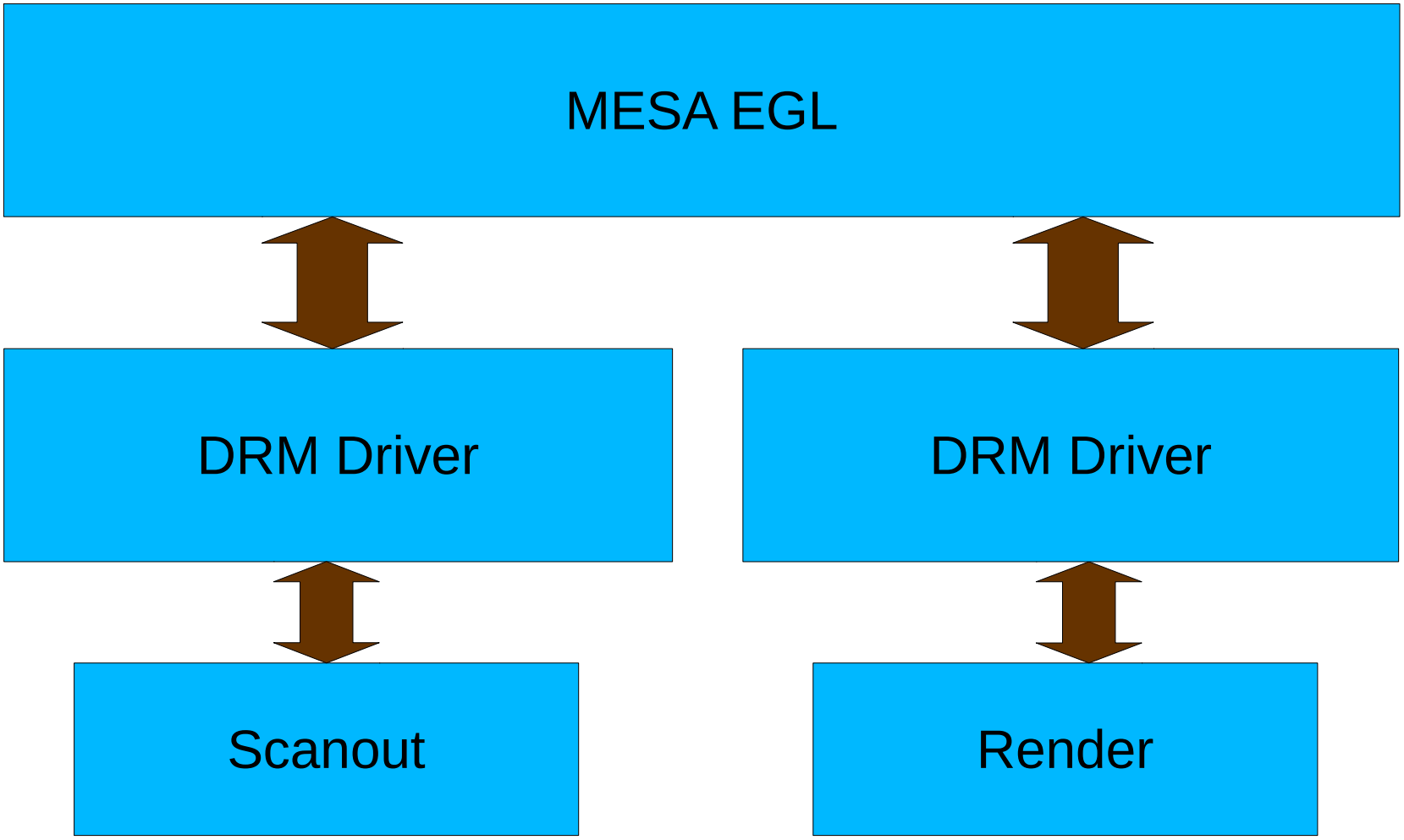

Embedded is (not so) special

- Laptops with discreet graphics are in the same game
- Christian has a prototype working
  - Fusing imx-drm and etnaviv
- Clean solution still needs to be worked out

Conclusion and outlook

- The ball is rolling
- Etnaviv may be the 2nd embedded graphics driver hitting mainline projects
- It is possible to get away from vendor supplied drivers
- Wayland support is coming

Questions?